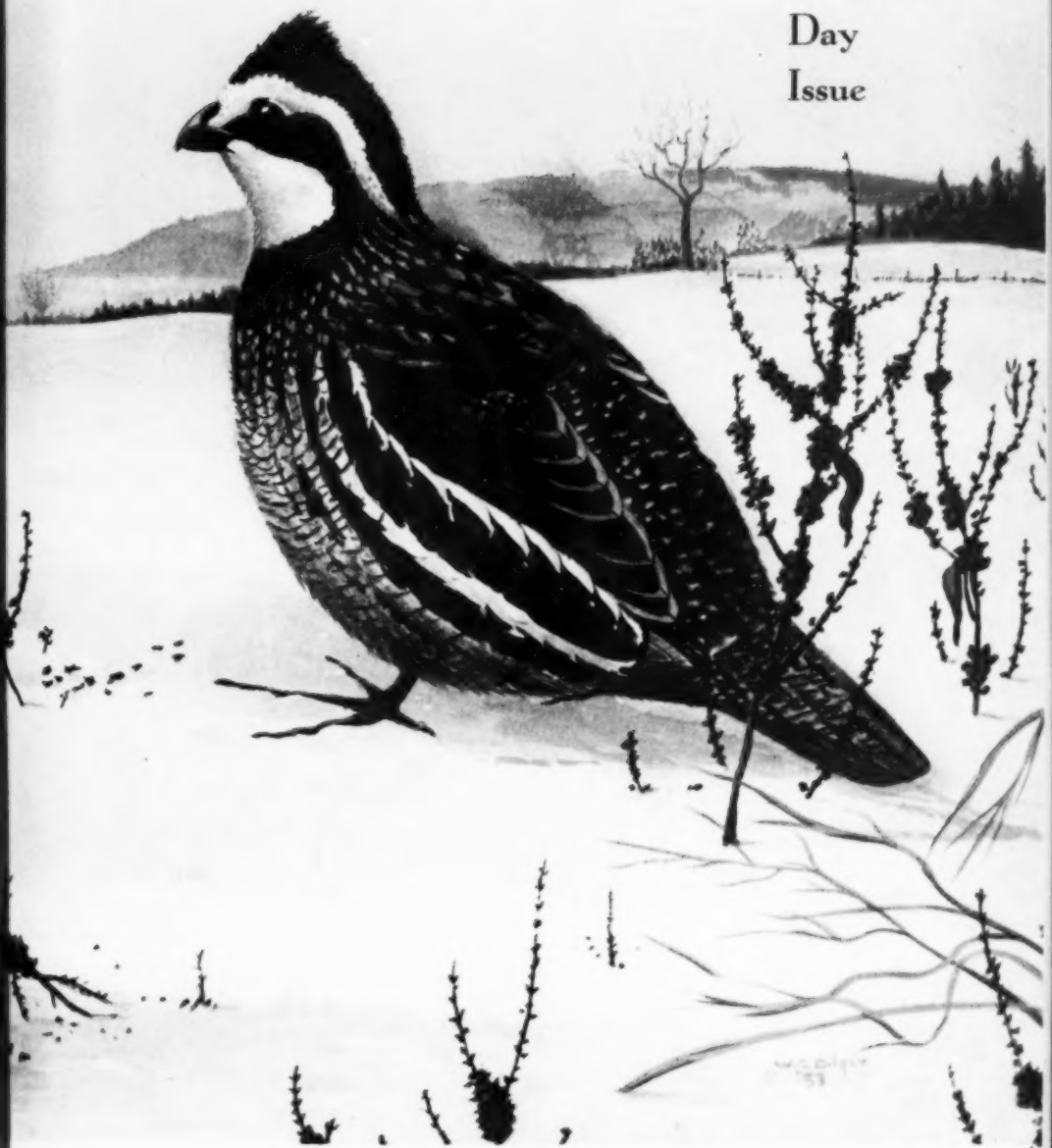
Arbor
and
Wild Life
Day
Issue



THE UNIVERSITY OF THE STATE OF NEW YORK

BULLETIN TO THE SCHOOLS

VOLUME 39 MARCH 1953 NUMBER 7

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The Arbor and Wild Life Day number of the BULLETIN is the only one devoted annually to natural history and conservation interests.

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COVER PICTURE: Bob-White Quail
From a painting by William C. Dilger

THE UNIVERSITY OF THE STATE OF NEW YORK
BULLETIN TO THE SCHOOLS

Issued monthly during the school year by the State Education Department

CHARLES F. PROBES, *Editor* MILDRED HAND, *Assistant*

This bulletin is sent without charge to all schools and educational institutions of the State. To others it will be mailed postpaid for $1 a year, 10 cents for single copies.

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The University of the State of New York

Bulletin to the Schools

VOLUME 9 MARCH 1953 NUMBER 7

Arbor and Wild Life Day

DURING THE PAST HALF CENTURY THE CELEBRATION OF ARBOR DAY IN our schools has been one of our most pleasant traditions. It comes as a welcome harbinger of spring, marking off the change of seasons, giving an opportunity to release pent-up energy and anticipating the pleasant days ahead. Of late years the occasion has come to mean even more. We have used it to point up some significant lessons in conservation, to emphasize our concern for bird and animal life, to inspire a love of nature and of country.

The poet Wordsworth has captured in a few words the significance of this springtime celebration —

> One impulse from a vernal wood
> May teach you more of man,
> Of moral evil and of good,
> Than all the sages can.

To make Arbor Day an interesting part of the experiences of youth is a real challenge to teachers. Many schools integrate the observance of Arbor and Wild Life Day with conservation projects that are under way in the school or the community. The celebration can contribute in building attitudes and appreciations for the maintenance of the school plant and grounds, and the school can help in developing a concern for maintaining the natural beauty of our local, state and national parks.

This annual program, too, can give emphasis to the inculcation of spiritual and moral values in our youth. It offers a splendid opportunity to call attention again to the ideals and traditions of our great Nation. Through it we can make contribution to the future strength of our country and stress again the great blessings which have been given in such abundance to our beloved land.

Therefore, by virtue of my office as Commissioner of Education, and in accordance with the law, it is my privilege to designate April 17th as Bird Day, and April 24th, May 1st or May 8th, whichever best suits the convenience of each locality, as Arbor and Wild Life Day.

Lewis A. Wilson

Commissioner of Education

What Worth Wilderness?

The Biologist and the Forester Find Undisturbed Wild Areas of Practical Value

PAUL B. SEARS
Chairman, The Conservation Program
Yale University

THE STATE OF OHIO, CONTAINING about 40,000 square miles, was once a magnificent hardwood forest. The forest types, thanks to the records of early surveyors, have been largely mapped. Yet it is almost impossible to form an adequate picture, from any surviving records, of the appearance of that forest. The state has its full share of memorials — statues, libraries, institutions; some useful, some not; some beautiful, many ugly. But somehow it never occurred to anyone to set aside a square mile, much less a township six miles square, of primeval vegetation for future generations to see and enjoy. Yet this could have been done for less than the cost of a single pile of stone of dubious artistic and cultural merit.

Farther west the "boundless" prairie, that living carpet of wonderful changing colors, is all but gone. Strenuous effort will be required to set aside proposed grassland national monuments. Unless this is done, the prairies will survive only on the pages of travelers' journals and in the descriptions of those who, like Willa Cather, knew and loved them.

We need not, said Darwin, marvel at extinction. But we have reached a point of civilization where we are no longer proud to be the agents of extermination. Once we are reminded that a species — key-deer, trumpeter swan, moccasin-flower or arbutus — is in danger, it is possible although never easy to rally help in preserving it. Often, as with the heath-hen and passenger pigeon, help comes too late.

The business of preserving game species moves somewhat more briskly, being substantially financed by license fees and insistent sportsmen. But for a long time the conserver of species, whether sportsman or not, missed the point. It seemed enough to slow down or stop the actual killing of individuals. We ignored an ancient rule of warfare, put into effect by Rome against Carthage: if you wish to eliminate, destroy the center of activity, the home.

Now the home of any species is the community of which it is a part. True, by juggling diet we can now get certain wild animals to breed in a zoo, but that is a sorry expedient. As Ding Darling once pointed out, you can always tell a tame mallard from a wild one by its pot-belly. If we are really serious about preserving any species we must preserve, in generous measure, its community of plant and animal life. Can we, in our own larger community of fierce competition for space, justify this?

Sentiment, of course, draws scorn from the practical-minded. But I doubt if sentiment is as fragile a defense as we think. How cheaply would the toughest-minded sell the loyalty and pride of those who serve with him in factory, field or countinghouse? How great can a commonwealth become, how long can it en-

NYSPIX — Commerce

Whiteface Mountain Ski Center, Adirondack State Forest Preserve; a Wilderness Recreation Area

dure, if it measures everything by price tag?

There exists, I suppose, such a thing as fundamental decency and gratitude and there are ways to acknowledge it. The Mormons have their monument to the gulls which saved them from the locusts. The Lord Chancellor sits upon a woolsack, memento of the source of England's early economic power. Many of us have seen the block expressing gratitude to the boll weevil which first obliged the South to begin diversifying its crops — a curious but impressive tribute.

We are, and rightly, generous in our regard for the group of most unusual men who made possible our Nation and planned its greatness. But we ought to remember, too, that in large measure our power and leadership are based upon the lavishness of Nature, building undisturbed through milleniums. The ancients thought it not unworthy to worship the gods who gave them grain — rice, wheat, maize. Is it unworthy in our enlightened day to commemorate, by generous preservation, the natural wealth which has been the lifeblood of our economy? I, for one, do not think so. To me it seems a matter of ethics and national self-respect.

An American commander in eastern Europe told me that he gave permission to the cold and hungry people of a city to help themselves to the trees in their ancient forest-park. This they refused to do, and the hard-headed general was deeply moved by their decision. It will not do to write off sentiment.

There is also, in the need for generous natural areas, the question of important scientific knowledge. The undisturbed community of plants and animals is a

beautifully organized dynamic system, employing energy from the sun for the use and re-use of water, air and minerals in sustaining abundant life, while keeping its own organization going. Technically this presents an exceedingly important phenomenon, the approximation of a steady state. Our knowledge of this phenomenon can do with considerable improvement, and again we need generous examples for its study. When men are beginning to talk rather seriously of raising some billions for the exploration of space, we ought not to neglect a more immediate, and definitely hopeful, source of knowledge. Knowledge for its own sake, like sentiment, is not lightly to be written off by a civilized nation.

It happens, however, that although the knowledge thus obtained is not likely to be patentable as a source of direct profit, its benefits diffused over the land-use pattern of our Nation should be very great. The studies of Dr John E. Weaver of the University of Nebraska, carried on through the years on a pitiful remnant of rented prairie, are of growing significance to the economy of the great grasslands of North America.

Just as the engineer in machine and industrial design must have at hand his theoretical apparatus of calculation, so the biologist and others who would design intelligent land-use, must have their norms or standards of measurement. And these norms, to a large degree, are to be found in the complex pattern of interrelationship represented by the undisturbed natural community. At present we have to rely largely on intuition — a wasteful and dangerous process, as is trial and error. It is a moral obligation to *know*, if we can.

Why are species which have endured for millions of years — the oak, chestnut, elm and beech — suddenly so vulnerable, now that we have disturbed their homes? Introduced parasites are not the entire answer. Why are the second-growth forests which now cover about two-thirds

NYSPIX — Commerce

Long Lake in the Adirondacks, Where the Two-Million-Acre State Forest Preserve Is To Be "Forever Kept as Wild Forest Lands"

of New England so full of inferior stock that a generation or more must pass before they become reasonably productive? Is it because we have systematically harvested the best and biggest trees, leaving only scrub individuals of bad heredity to reproduce themselves? Four thousand years of corncobs are piled up in Bat Cave, New Mexico, and the ones on top are as scrubby as those at the bottom. Presumably the Indians ate all the big ears instead of saving them for seed. What happened in the cornfield can happen in a forest. We need to know.

Yet neither knowledge nor sentiment alone afford the most powerful justification of ample wilderness or natural areas set aside in perpetuity. Rather it is the mixture of practical, theoretical and ethical symbolized by the question, "What kind of a Nation do we want?" Do we wish to build a future completely and ruthlessly mechanized, standardized and artificial? Do we really mean to crowd back Nature to the utmost minimum, depending upon ingenious artifice at every turn for physical and spiritual sustenance, until we have to eat standing up and the healing which comes of solitude survives only in dreams?

The hour is late, but we still have a measure of freedom to choose.

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Wildflower Conservation

Education Is a Critical Need for the Protection and Enjoyment of Wildflowers

MRS LUCIEN B. TAYLOR
President, New England Wild Flower Preservation Society

THIS DISCUSSION deals specifically with the problems encountered by the New England Wild Flower Preservation Society in the conservation of native plants—problems common to all the northeastern states.

Ever since 1920, when the society was formed under the auspices of the Massachusetts Horticultural Society and The Garden Club of America, it has preached the importance of native plants in the landscape and the desirability of leaving choice wildflowers undisturbed wherever they might be found. Free illustrated lectures on the subject have been lent to innumerable schools and a similar lecture for adults has proved popular. The society also actively supports the conservation courses given regularly in Massachusetts schools by teachers from the Massachusetts Audubon Society.

About 25 leaflets dealing with different phases of wildflower conservation and with the treatment of specific plants in need of conservation are given out in large quantities at Boston Flower Shows and are sent free to anyone in New England who asks for them.

A Conservation List naming choice plants in special danger of extinction is much used by garden clubs, Scout leaders and schoolteachers. It has helped to pro-

tect many a rare flower from overpicking. The society does much to lessen indiscriminate use of Christmas evergreens; for some time almost no mountain laurel or ground evergreens were used to decorate public places in the vicinity of Boston where the society's headquarters are located.

Legislation was put through so that all native orchids, azaleas, trailing arbutus and cardinal flowers are protected by law; but to enforce such laws is difficult.

It is not easy to change one's viewpoint from the early ideas about conservation expounded by conscientious conservationists. If one abided by these early teachings it would be unthinkable ever to pick any wildflower on the Conservation List or to dig up a plant for any reason, no matter how plentifully it grew.

To suit the changing times it is evident that a more realistic approach to this vital and controversial subject must now be adopted. Where once almost no laurel was to be seen at Christmastime, suddenly ropes of it are appearing around miles of city lampposts and the pillars of public buildings. Upon investigation one finds, in many cases, that the commercial value of laurel has become so evident that farmers now sell it as an annual cash crop. Gardeners who once bought collected wild plants for their gardens for about 16 cents each can no longer do so because the farmers make more money on Christmas greens. Often, too, the collected plants failed to thrive. Many farmers clearing land for pasturage have to get rid of laurel because the leaves are poisonous to cattle.

Ground pine is treated with fireproofing material which also makes it resistant to a dry atmosphere so that it is very long-lasting. It is sold by the ton on the market. No doubt all of it was pulled up by the roots; this is a very difficult situation to correct.

Since the number of dealers in such evergreens is increasing it is important that those who have undertaken to grow them should receive every encouragement. The Massachusetts Conservation Council is backing the society in an effort to find the true situation in regard to the commercial use of Christmas greens.

It is apparent from the above statements that the conservation of native plants is a relative matter and that it is practically impossible to lay down rules concerning what *not* to do that apply equally to all situations. There must not be one set of standards for the commercially minded and another for average citizens.

Practically every native plant needs conservation somewhere and no single conservation list is satisfactory even within a state. For instance, trailing arbutus is a rare wildflower in many places but there are areas where it is extremely common and where to prohibit its use entirely would hinder rather than help the cause of conservation. There should be numbers of "conservation lists" suited to the widely varying conditions found in different localities. People should remember not to protect their own native plants at the expense of those brought in from other parts of the country where the residents are up against the same sort of vandalism that we are seeking to overcome. If the right attitude is adopted, most of our favorite wild plants can be made safe from extinction. The great majority of citizens know little about any phase of conservation. The do's and don't's which anxious conservationists try to enforce are totally lost on the bulk of our population, and they are the ones who must be reached.

The answer is to try, through education, to show people what they *can* do to enjoy these plants and to protect them at the same time. If we could show that it is possible, by intelligent cutting, to have an adequate supply of evergreens, holly berries, black alder berries, bittersweet

and the like from year to year, without permanently destroying the source of supply, we would be accomplishing real conservation.

It is a pity that so many fine stands of holly, for example, have been needlessly wiped out by vandals in too much of a hurry to escape detection to gather the twigs properly. Even where such stands still exist they may not continue to thrive if left untouched. The owner of a wonderful growth of virgin holly — some trees up to 50 feet high — recently visited, admitted that the trees grew less vigorously every year because of the encroachment of other forest trees. These hollies fruited much less heavily than specimens which stood more in the open. It is not good conservation to leave a plant habitat untouched under the erroneous belief that natural conditions remain unchanged indefinitely. They can not be kept so without outside help, which often is not forthcoming.

The greatest destroyer of our native wildflowers in woodlands and all wild land areas is, of course, fire; and awareness of its disastrous effects and the necessity for strict prevention must always be emphasized in the schools and with the adult public.

A start in presenting a positive conservation program has been made by the New England Wild Flower Preservation Society in cooperation with the Garden Club Federation of Massachusetts. For some time garden club members making flower arrangements for public display at flower shows have been forbidden by rules governing the shows to use in their arrangements any plants on conservation lists even if the plant material came from the exhibitors' own gardens. Much bad feeling has resulted and exhibits have been

Courtesy of Massachusetts Horticultural Society

A Typical "Ground Pine" (Lycopodium) Community Including Also Checkerberry, Trailing Blackberry and Hair-Cap Moss
If rifled for "Christmas greens" recovery is very slow

disqualified under trying circumstances. The society believes that more people would plant native material on their places if they could make use of it as they saw fit after they had done so.

A card has been printed by the society to accompany exhibits using native material for public display stating that it was properly gathered where locally abundant, on the exhibitor's own place or with the permission of the property owner. Several hundred of these cards were used during the past year and it is gratifying to report a noticeable increase of interest in wildflower conservation and in the work of the society as a result of the change in policy. Massachusetts stands alone in this decision, so far as is known to us. The use of all orchids is prohibited by general consent, however. Having suffered misgivings for having instigated this change which, as a matter of fact, immediately brought objections from several wildflower lovers who did not understand the situation, it was of more than passing interest to read an article in the October 1952 issue of Wild Flower, the quarterly of the Wild Flower Preservation Society, Washington, D. C., under the title "Forcing Native Orchids." The New England Society would hesitate to suggest such use of these choice plants and would certainly be severely criticized if it did. This further demonstrates how difficult it is to satisfy all points of view in wildflower conservation.

Probably the best way to preserve native plants is in private wildflower gardens and in sanctuaries. The owners of such places are being urged to register them with the society so that notice can be given whenever there are wildflowers in their vicinities to be rescued. Many a fine stand of readily transplanted wildflowers would be flourishing in a new home today if such information had been at hand when needed.

The society, in cooperation with the six New England garden club federations and several of the state universities, has started a program of research in the propagation and culture of native plants. Information is being gathered from every possible source and a committee is already at work on a bibliography. If wildflowers can eventually be propagated in quantity it will eliminate worry about their extinction. Some dealers who could propagate plants if they wished to, still collect them from the wild because it is cheaper. This should be discouraged.

Any wildflower lover could help with this project. Whenever a good stand of attractive native plants is seen in a drive through the countryside, stop the car and record the following information: (1) the general habitat, whether in sun, shade, wet or dry location etc.; (2) the most prominent companion plants. Then take a trowelful of soil for analysis. Send the information to the office of the New England Wild Flower Preservation Society, Horticultural Hall, Boston. By comparing data on similar plants the common factors necessary for their successful culture may be learned.

The society has prepared an entirely new program for wildflower study in the fifth and sixth grades in the schools. It was done with the help of a particularly well-qualified science teacher in the school where the program was given a satisfactory preliminary tryout. Its aim is to make children familiar with and appreciate the native trees, shrubs and wildflowers common in their respective localities and to understand their importance in the landscape. Those in special need of conservation are stressed and the children will prepare a special conservation list for their own area. The children will thus automatically help in the Wild Flower Census which is being carried on with the Propagation Project to learn

Courtesy of Massachusetts Horticultural Society

An Inviting Pathway in a Wildflower Garden, Bordered by Wild Iris, Osmunda Ferns and a Natural Association of Flowering Plants and Shrubs

the true status of wildflowers throughout New England. Interest in the census has been expressed by states outside of New England. Pennsylvania is particularly helpful and New York should also be interested.

Only single specimens of any wildflower should be brought into school by

the children until its place as a common or rare flower has been decided in the classroom. This should remove the danger of bringing in quantities of a new flower and discovering, too late, that it should not have been picked freely. No orchids at all should be picked. The society's Conservation List and the Hyde Chart, picturing important plants on the list available at nominal cost, should be the basis of discussion before starting the program. Specimens of each flower are to be pressed and mounted under cellophane on squares of brightly colored mounting paper. Some children like to make individual scrapbooks or to illustrate poems on wildflowers with watercolor paintings. The children have the privilege of becoming junior members of the society for a fee of ten cents. This gives them an attractive button to wear and a chance to have their work exhibited at an annual meeting for junior members where suitable recognition will be given them and where a good outdoor educational movie will be shown. It is hoped that, in time, several such meetings will be required in various parts of New England.

Three sets of illustrated lectures are given during the school year including 20 fall, 20 spring and 20 summer flowers. The slides making up each set should be chosen to suit the locality where they are to be used and the society will need a large selection to accomplish this. A state university professor remarks that if the children actually learned the names of 60 flowers during a year this, in itself, would be a noteworthy achievement.

It might be well, at this point, to mention obstacles to carrying out the school program recognized as a result of talks with conservation teachers. Some suggest the title " Wildflower Study " can not be used because most boys consider anything about flowers to be " sissy." But this is a test of the teacher's skill. Some teachers prefer not to try the program for fear that flowers will be brought in which they can not name. If it could be understood that teachers and pupils would learn together it would be mutually beneficial. If the teacher is already a nature lover the program runs itself and such teachers make possible the glowing accounts of nature interest in certain schools. Some schools would start the program if a wildflower enthusiast from outside would help with it. Here is a splendid opportunity for the conservation chairmen of local garden clubs to arrange for an occasional visit from the right garden club member.

When a flower on the Conservation List is very plentiful in certain areas, children resent being told not to pick it and will do it anyway, thus acquiring disrespect for what the conservationist is trying to teach. It would be better to stress the right way to pick such flowers and to encourage moderation in doing so rather than to forbid the children to touch them.

The greatest challenge is to maintain the interest of the children from the sixth grade on. Such a program to follow the fifth grade project, just described, is now being tried out. Similar lectures will be given on native trees and shrubs. A piece of land containing a brook, swamp, woodland and other features will serve as an outdoor workshop. The local garden clubs will be given a personally conducted tour by the children, who will enjoy showing off what they have learned.

If citizens throughout our country would learn to look upon their familiar landscapes with an understanding and appreciative eye they would find that the native plants, above everything else, lend individuality to each section and that their removal detracts greatly from the pleasure aroused in visitors attracted to that area by the typical scenery always taken too much for granted by the local inhabitants.

"Friend Fox"

Does Instinct or Reason Rule His Behavior?

OSCAR W. OJA
Forester, Pack Demonstration Forest of the State College of Forestry Warrensburg

ONE EVENING in the Adirondacks I opened the back door of my quarters to toss into the darkness a mouse I had just caught. While the mouse was in mid-air, I noticed a fox dashing out of the area of light from the back door. As a red fox will often do, it stopped and glanced back; in spite of the darkness it must have seen the mouse still in air for it changed its direction and had the mouse almost at the moment it landed at the edge of the clearing. Probably that incident gave the fox its first idea that I was somehow associated with food — in spite of whatever else he may have thought of me — since the same thing happened several times afterwards when I had to dispose of a mouse.

One evening, while cleaning a catch of fish by lantern light, I heard a rustling in the darkness behind me. Although I could not tell whether it was a raccoon, a fox or some other night prowler that had become interested in this frequent chore, I appreciated the company in my silent drudgery enough to throw an occasional fish entrail into the darkness over my shoulder. The oftener I did so, the bolder became the scurrying outside the circle of light. On these occasions I was careful to pretend that the throwing of bits of fish into the outer darkness instead of into the waste bucket was entirely without design, and on getting through with the fish-cleaning I was careful to empty the waste bucket so that my unknown companion would easily find the scraps. Then again, as if by chance, I would toss an occasional scrap so that it fell just within the area of my light. It was not long before a sleek-coated fox would step daintily within the circle of light, pick up the morsel of fish and withdraw into the darkness. Meanwhile I would pretend to be so absorbed with my fish cleaning that I would not take notice of him even if he should nip my heels. At times I could almost feel him sitting behind me and intently watching my every move.

The fox must have kept me under closer observation than I realized because one evening, while it was still light, I looked up from my fishing to see him sitting on the shore watching me. Since the distance from my boat to the rocky ledge where he sat was only about 30 feet, I quietly spoke to him and otherwise made it plain that I was aware of his presence. With that the fox stood up, took an embarrassed turn around a tree and reseated himself on the high rocks, as though indicating that he had no intention of distracting me. Pondering the matter and being hesitant to credit an animal with reasoning, I rowed further along the lake shore only to have the fox also wander along the shore to be opposite me again. It was a full mile from my quarters down the lake from where he had probably followed me, and I realized then that it had no doubt happened before. I chuckled at the thought of it; and I noted with admiration that his coat was a burnished copper in the setting sun, his black fore-

legs and paws blending into the dark rock he sat upon, and his white waistcoat and white tip of tail so like a starched dinner attire. His alert ears, joined by a benign grin, suggested a forest squire savoring the smells and prospects of a good dinner at an elegant hour.

I further encouraged his apparent association of me with food by strategic placing of mice and table scraps at the back door and along the trail from the door to a weather recording station I attended mornings and evenings. One morning, as I was about to step out, I was rewarded to see him sitting there waiting for me. I stepped back, put a few pieces of food into my pocket and again started out to the weather station, 100 yards from the back door. Without evidencing any recognition of his presence, I tossed him a morsel. He followed close at my heels and watched me read the weather instruments. Thereafter his constant morning presence at the back door and the attentive cocking of his head while I took weather readings might have flattered me into thinking that he perhaps suspected I could produce weather as well as food.

His weather station companionship developed to the point where he would seem to mimic me when I was seized with a fit of sneezing and coughing as I stepped out into the chill morning air. Then he would sit back on his haunches, with lolling tongue and laughing expression, as if to say, "Ain't we got fun?" Thinking about his mimicry, it occurred to me that sometimes a fox's bark sounds like a human cough. I wondered if the fox thought mine was a morning greeting.

In our going to and coming from the weather station he showed me deference, however, by following close at my heels and sitting at respectful attention while I made the observations. Invariably he would start out ahead of me but would quickly step aside to let me pass and then

Here Friend Fox Is Unusually Wary in the Presence of the Photographer

fall in behind; he also accorded me the head of the procession back to my quarters. Here again the fox was shrewdly serving his own ends by avoiding anyone following close behind him while I thought deference was being shown me for befriending him.

It is a much debated matter as to whether our friends of the forest behave as they do through instinct or reason. The following incident indicates that the fox had some reasoning ability.

We had reached the stage of his training where I felt he should enter the house for his meals. One mild evening of early winter when I was alone at my quarters, I placed the dish containing his supper on the living-room rug so that he would be unable to reach it without stepping into the room. The rug covered the floor except for a margin of about one foot around the edge of the room. The fox came up on the front porch, looked in the door and of course saw his supper dish. He seemed to have a decided aversion to stepping across the threshold. He craned his neck, turned around, lay down and went through a variety of antics in his attempts to reach his supper without crossing or stepping over that threshold. Finally, to my surprise, he took the edge of the rug in his teeth and tugged at it until a word from me made him drop it. Although he tried several times to pull the rug toward him and thus bring the dish within reach, he did not step on or over the threshold. Of course I finally rewarded him by moving the dish to the edge of the rug and within his reach. What impressed me about the rug incident was that he had observed that the dish would be brought nearer if the rug could be pulled toward him.

The first few times, on his learning to come indoors for his food he would first make a tour of inspection of every room in the house while I quietly waited for him in the kitchen. I could hear his progress from room to room because his toenails would patter on an occasional space of bare floor and would again be muffled by a rug. On being satisfied that no others were present, he would come into the kitchen and enjoy his dish of food with no more wariness of me than if I had been the kitchen range. When I had finally taught him to come regularly into the kitchen for his food, members of my family would have to keep to their chairs and be quiet while he was having his meal. After meals he would be uneasy until let out. Once out of doors but while still on the porch, he would sit there and, much like a cat, wash his face, paws, whiskers and chest. He usually finished off his primping with a catlike rubbing of his back and sides on the porch columns. When the snow was

Time for Dinner

hard and granular he would slide along on his back as if to comb his coat.

House guests one day brought with them a highly spiced meat, some of which I offered to the fox. He seemed to relish it but between helpings he would lay his chin on the snow and push himself along for several feet as if to cool his throat. When that did not suffice, he would scoop up a mouthful of cooling snow and immediately come back for more of the spiced meat.

In our play with a rope he would tug at the other end only to a certain amount of pull on my part. It finally dawned on me that he was being very careful not to have his needle-like teeth sunk into the rope when I might pull on it so hard as to break some of them.

When I first introduced a shuttlecock in our play, he would attempt to chew it — probably because the feathers suggested food — but he would appear baffled with the tasteless cork portion of the shuttlecock. In my tossing it to him he would sometimes catch it in mid-air with a bound and at other times pounce on it as it tumbled along the ground. Because he loved to mouth it, he was at times reluctant to return it to me and then did so only at my command. On dropping it at my feet, he would anticipate my throwing it again by running back and preparing to dash in whatever direction I might aim. He finally caught on that the shuttlecock was to be thrown and retrieved without being eaten, and demonstrated to me by taking it into his mouth and with a quick toss of his head, sending it flying in a high arc. Then, as if he had gauged the whole antic, he would dash after it and often catch it before it landed.

On several occasions I found indications that he had followed me unnoticed during a trip afoot in the forest. Perhaps he had seen me leave my quarters from wherever he lurked during the day, or had picked up my trail after some distance afield.

Often, long after he had had his evening meal and vanished into the night, he would return to the window near which I would be seated, reading. My first indication of his doing so was a slight sound outside the window. Looking up from my reading I was startled to see him sitting there on the porch and grinning at me. My stepping to the door with a snack for him and a word of greeting became an almost nightly ritual with the added development that he would lick the window pane until he had attracted my attention. His sociable nightly call seemed quite cute until one evening I was more absorbed in my reading than in bothering with him. Pretending that I was unaware of his presence, I suddenly realized that he was sinking his teeth in the wood partitions of the window sash and patiently removing sizable portions with each bite. Since I was at fault for having encouraged this development I stepped out, and without reprimand, gave him his usual snack and greeting. Thereafter I did my evening reading near a window out of his reach.

Our relationship came to an end because I, increasingly, showed him to friends and visitors. This he probably resented. When I called him from the nearby woods merely to show him off, he usually stayed away for several days at a time. Finally he indicated his distaste for my notions by less and less frequent visits to my quarters until I saw no more of him. Thereafter, on seeing a fox on the forest, I had only the forlorn hope it might be my old friend even though he were snubbing me.

DeBar Mountain Wildlife Refuge

Notes on a Long-established Wildlife Research Study Area

GREENLEAF CHASE
District Game Manager, Adirondack District
New York State Conservation Department

Photographs by the author

IN ITS MANY YEARS of refuge status the DeBar Mountain Game Management Area in the Adirondack State Forest Preserve has quietly functioned as a wildlife research study area. Lying somewhat off the beaten trail in the town of Duane, Franklin county, and closed to public trespass, this area of approximately 8390 acres is bounded by mountain peaks, the highest being DeBar mountain (3305 feet) for which it is named.

When Verplanck Colvin in 1877 " from the high peak of DeBar beheld with delight over 100 miles of the great river [St Lawrence] " and " observed the first angles connecting the survey of Lake Champlain with the system of the great Northern and Northwestern Lakes," he described the general area as clothed with vast stands of great pine, spruce and hemlock. Long since, these virgin forests have been absorbed into the economic structure of the region. Save for the summits of East mountain, DeBar and Sable mountains, where first growth red spruce still persists, all the coniferous stands on the area had been cut over prior to 1927. Fire found an easy mark in the cutover pine stands, and the northeastern portion of the area was burned clean to the mineral soil. The pioneer plant species that came in on the cutover areas and " burns " offered food for deer and beaver in better quantity and variety than had been available before the dense coniferous stands had been removed. The refuge principle of protecting and increasing stocks of wildlife was therefore well adapted to this large tract with its wide range of favorable food and cover conditions.

In little more than a decade after the purchase of the area in 1927, the deer numbers had reached such a high point that their wintering yards were overcrowded and the heavy browsing was causing damage to the tree species. White cedar, hemlock and balsam reproduction in the flats along the Hatch and Hayes Brook watercourses was gradually eliminated. A definite " browse line " became evident on the taller cedar and balsam within these coniferous stands, whose skirts had formerly hung low. The severe winter of 1939–40 caused heavy mortality to the deer herd because of deep snows and accumulative overbrowsing of their winter food supply, principally soft and hard maples, yellow birch, viburnums and cedar. Concern for the welfare of the deer previously expressed in artificial winter feeding was now of no avail. Simply stated, there were too many deer for the available winter range to support.

Meanwhile, from the efforts of another wildlife agent, changes were drastically disturbing the normal ecological cycle of vegetation. Beavers, also under complete protection, were richly enjoying the dense " popple " stands which had come in on the burns. Spreading up the five miles of Hatch brook, they increased rapidly and exhausted the seemingly inexhaustible

The Forest Succession after Lumbering and Fire, with Interplanting of Spruce; Northeast Corner of Debar Refuge

reserves of poplar trees and moved on to tributary streams, cutting not only poplars but soft maples and birch. These openings and water impoundments, in the first instance perhaps, were not particularly beneficial to other wildlife, but over a period of years the combination of many factors such as water storage, increased fertility and the establishment of aquatic plants, drew in waterfowl, fish, muskrats, otter and other fur-bearers. And where these ponds were abandoned, the beaver meadows and alder flats abound with songbirds and other tiny people such as shrews, moles and mice. An occasional gaunt, giant snag reminds one of where the great pine forest stood.

That the deer and beaver each have caused changes in the ecology of the area has been pointed out. Man has been a third agent in recent years in effecting change through his creation or maintenance of service roads, trails and boundary clearings. Constituting desirable "edge" habitat, the resulting herbaceous borders have been most attractive to wildlife, principally benefiting among game species the ruffed grouse. A substantial reforestation effort on portions of the burn in a pattern of strips and scattered blocks has provided "escape" shelter and cover of special value to the varying hare or snowshoe rabbit. During the plantations' growth the current period, now between 10 and 25 years after planting, best serves this animal, for the tree crowns have not yet closed in and the lower branches still provide ground cover.

A fourth and most recent alteration in a normal recovery pattern of plant and animal relationships has been the destructive "blowdown" of 1950. Nearly all the remaining first growth spruce and hemlocks were affected to some degree, creating a picture best described as a "horrible mess." A partial cleanup of

fallen timber is in progress, but topography and difficulty of operation are against any full-scale salvage.

Through these various episodes of ecological change, measurable trends of abundance have been noted among wildlife for which this area was designated. These are not attributable to its initial purpose for protection against hunting alone, but rather to a combination of beneficial changes in desired habitat.

DeBar Mountain Game Management Area was established as a game refuge at a time when public thinking was strongly in favor of setting up a system of refuges. There were four other refuges established during this period (1927–29) within the Adirondack Forest Preserve, namely: the Arietta, Minerva, Ray Brook and Raquette Lake areas. The idea was carried along over the years, by those interested in wildlife resources, that a tract of land capable of producing crops of wildlife needed little help other than protection against hunting and trapping. Surpluses of wildlife so produced would then cross over the boundaries and supply the surrounding region. But it has long since been perceived that posting and patrolling such areas made little difference in wildlife abundance unless other important things were available, including adequate food supply and suitable cover, and unless under certain circumstances, supplementary feeding and predator control were carried out.

Stocks of wildlife which might benefit by refuges, namely deer, beaver, bear, grouse and varying hare, were increasing generally throughout the Adirondacks. There never was any appreciable flow of wildlife to the outside of these areas except in the case of beaver. On the contrary, deer have proved themselves capable of starving to death within their favorite haunts rather than moving a few miles to better range. With the annual cost of maintaining these lands proving unjustifiable, they were abandoned as game refuges in 1934 with the exception of the DeBar Mountain Refuge. This was continued as a study area refuge and later redesignated a game management area in 1945.

In the latter category, under the law, some controls could be applied when necessary in removing surplus crops which were not possible under the former refuge designation. Since then varying hares, beaver and deer have been "harvested" periodically when their range became overpopulated.

Within the past 25 years of transition at DeBar, there has been a continual ebb and flow in wildlife populations due primarily to changes in food, cover and water. With possibly one exception, all wildlife residents on the area are somewhat dependent either on man's activity (or the lack of it) or accidental means to accomplish gains or losses. Beaver, the notable exception, largely created his own habitat. Some forest destruction has resulted from his flooding and sometimes he has injured deer wintering areas. Having since occupied and eliminated all best habitat, he has made second choice, third, and on down the scale with an amazingly adaptive and versatile degree of survival that no other native species seems to possess. Whereas with most species the gain or loss in their individual populations affects only a few other species, the gain or loss of beaver populations affects a host of species.

Originally only one natural pond existed on the tract. Today there are between 40 and 60 beaver ponds, varying in number from year to year and in size. Migrant birds and wandering animals make great use of these water areas; probably not a few have become residents due entirely to their influence. As older beaver ponds become inactive and revert to alder

A Chain of Beaver Ponds on the DeBar Refuge, Showing a Beaver Lodge and Timber Killed by Flooding

swales, new ponds fill the breach for nesting black ducks, wood ducks and hooded mergansers. Similarly, the shift is made by muskrats and, to a lesser degree, by the more itinerant mink and otter. The colonies of tree swallows and grackles find suitable nesting trees in or near newly made beaver ponds, forsaking the old pond bottoms now dry. Raccoons and bears work over the shifts in frog populations which follow the beaver activity. Deer graze heavily on the old pond bottoms from which sprout succulent plants. Foxes and weasels move in sequence with the rodent population. In fact, there is never a dull moment on a chain of beaver ponds old or new, wet or dry.

During the 25 years of state ownership, the "guest book" at DeBar Mountain Game Management Area has been signed by some interesting visitors. In 1929, a small herd of six elk donated to the State were released. Increasing to 12 within two years, the herd got the wanderlust and ranged outside the refuge. The last elk track was seen at DeBar in 1941, 11 years later. Except for occasional rumors during the late 1940's, all survivors are gone from the region. An unsuccessful attempt to stock wild turkey in the early 1930's, surprisingly for the unfavorable habitat, carried two nesting hen turkeys over the second spring. Raccoons broke up one clutch and a lumbering black bear accounted for the last clutch of eggs.

A family of three Canadian lynx visited the area in 1934 but has not been heard from since. The surrounding wild country is vast and, to a great extent, unbroken by roads. It is, therefore, favorable to such wandering visitors. As late as 1952, a cow moose was twice seen north of the DeBar Mountain fire tower. Golden eagles often observed during 1950 and 1951 were possibly summer residents nearby. A raven appeared during the winter of 1951 and its discordant croak was a welcome sound on the quiet frost-cleansed air.

Coyotes, now at home throughout the Adirondacks, find much of this area to

their liking. Since they are rugged and adaptive competitors in the predator picture, it is likely that some displacement of the fox and bobcat equilibrium can be expected locally. With their ability and accomplishment in killing deer when other food is scarce, the coyotes remain in doubt as to future status in controlling deer populations. There is no indication that substantial predation by coyotes on deer does exist; however, the unwelcome presence of the coyote is felt by many as an added burden. This is particularly true in those areas where sentimental attachments still hold for excess populations of deer or, in the opposite extreme, where other and often infamous practices of overharvesting the deer herds brook no interference from an "outsider." The problem is how to maintain a natural balance.

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Modern Tree Nursery Operations

Much of the Planting and Cultivating Is Done by Machinery

EVERETT J. ELIASON
Assistant Superintendent of Tree Nurseries
New York State Conservation Department

MOST PEOPLE are familiar with the cones or burrs which occur on our evergreen coniferous trees. All such trees, at some time in their life, bear from a few to an abundant crop of cones. Species grown in this part of the country have cones which vary from the size of a pencil head in the arborvitae to those up to ten inches long in the Norway spruce. The cones on Norway spruce — a common park spruce — when green are somewhat of the shape of a banana. The cones are a stage in tree reproduction, arising as they do from flowers. The cones produce seed which, when they germinate, start a new tree. In nature, the cones open in the fall, thereby loosening the winged seeds which fly with the wind. Foresters collect the cones earlier before they open, and by means of drying-ovens cause the cones to release the seed, which are caught, dewinged and cleaned for sowing in the nursery. This is the first operation in the life of the nursery-grown tree which makes use of machines. Machines are being used extensively in nursery work, just as in all other forestry and agricultural work. Here the machines clean the seed by methods simple in principle. The seed is separated from the nonseed materials by use of screens of different-sized mesh and finally, on the basis of weight, by means of a blower.

Common mechanical farming tools prepare the land for seeding. Prior to the sowing operation, a so-called seedbed former is pulled over the area. This forms the beds, somewhat raised, with a smooth surface four feet wide and with paths between the beds. Next comes the tractor pulling a fine rake which slightly roughens the surface to catch the seed

Cultivating Paths between the Seedbeds To Destroy Weeds and Prevent Soil Wash

when it lands from the sower. Sowing can be done by machine but considering the accuracy needed and the value of the seed, hand sowing is actually more practical in this step. After sowing broadcast the proper number of ounces of seed per area, the seed is pressed into the soil surface by a large roller, pulled by hand or tractor. A specially constructed machine then covers the seed with a thin layer of sifted sand. Next come tractor-drawn wagons loaded with shade frames which are set over each seedbed. Over the shade frame a layer of burlap is unrolled and pinned down on all sides. In this way the beds remain moist until the seed germinates. After germination the burlap is removed but the shade frame remains until the fall of the first year.

In November a machine spreads a layer of pine needles over the first-year trees. These needles mulch the trees over winter. In the spring the needles are removed and hauled away by tractor-drawn wagons.

During the first, second or maybe the third year, the seedbeds are sprayed with an oil spray, which kills the grass and weed species without harming the trees. A mechanical sprayer with an 18-foot boom spreads the oil, applied once about every two weeks. The paths between the beds are kept free of weeds and roughened with a powered cultivator to prevent erosion during the life of the seedbed.

Trees ready for moving to the field for the start of plantations are mechanically lifted by a blade drawn under the seedbeds. This is an attachment to the tractor. Now under test is a modified potato digger which not only lifts the trees but shakes a portion of the dirt loose from the roots. After removal by the lifting machine the trees are tied in loose bundles, packed into large crates or baskets and then transported to the packing shed. Here over a series of moving belts the trees are culled, counted and tied by means of electric bundle tiers. One hun-

dred trees go into each bundle. Such counted lots of the various species are now ready for final packing into larger bundles and crates to be transported by railway express or truck directly to the tree planters in all parts of the State. Some planters have, or hire, mechanical tree planters, which open a slit in the ground and compress the soil after the tree is put in place.

A plantation once established and growing still feels the touch of mechanical tools. Fire lanes are made and maintained with the mechanical plow, harrow or roto-tiller. When insect epidemics threaten, spray materials are applied by powerful ground spraying rigs, or possibly by airplane or helicopter. The trees may be pruned or thinned in older plantations with a portable power saw. Many years later when the tree is finally ready for lumber, it will be cut and sawed into useful material by the mechanical horse.

This relates the methods used by the New York State Conservation Department which has the mission of producing millions of trees for the State's landowners. The two state tree nurseries, at Saratoga and Lowville, have a combined capacity and usual inventory of about 125 million seedling trees, with a present annual distribution of 40 million trees. All these are made available to private or community landowners, who take up about 75 to 80 per cent of the stocks; the remainder are planted on state-owned land. Of the 545,000 acres comprising the State Forests, about 33 per cent was in woodland at the time of acquisition, and the remainder is being reforested. About 75 or 80 million trees would complete the necessary planting.

The species available are white, red and Scotch pine, Norway and white spruce and larch. Some stock of hemlock, balsam, black locust, jack and Aus-

Spreading Fertilizer on the Seedbeds by Means of a Special Machine

trian pine and Douglas fir are grown, but since these species have either limited use or special site requirements, relatively few are grown for general use. All these species are available to the private landowner provided the requirements in planting sites are met.

A private planter can grow his own stock but this is generally discouraged since one is apt to encounter several troublesome problems due to inadequate facilities. It is therefore better to obtain planting stock from the state or private nurseries, although hardwood trees or shrubs can be grown relatively easily by sowing the seed in the garden at the time it becomes ripe. Suitable stock can be raised in one or two years. The important point for this type of tree is to plant on fairly good soil, and to care for them by cultivation for two or three years. Any planting project, in fact, actually sets up a liability, and regular care should be planned throughout most of the trees' life history. Conifer plantations should be cared for as early as six, eight or ten years and followed by intense care as the stand closes in, at 12 to 20 years. This care consists of releasing from unfavorable competition, repairing insect damage, pruning or thinning as well as over-all protection from fire and disease. Salable Christmas trees can be obtained from several evergreen species during the care period, and this early crop will aid in financing the project.

The trees produced by the New York State nurseries are for forest planting only and no order for less than 1000 can be accepted. A list of the trees available and an order blank may be obtained at any time by writing to the State Conservation Department in Albany.

NOTE. The following bulletins, obtainable free from the New York State Conservation Department, Albany, are suggested for further reading: No. 2: Forest Planting in New York; No. 20: New York's Reforestation Program; No. 21: New York Forest Practice Act.

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Acknowledgment

This Arbor and Wild Life Day number of the BULLETIN TO THE SCHOOLS was compiled with the cooperation of the New York State Museum. The editor desires to express his appreciation to Dr Carl E. Guthe, Director of the State Museum; to Alvin G. Whitney, Assistant Director, and to all who contributed articles and photographs.

Back into the Past

Art and Research Join To Reveal Life in New York When Mastodons Roamed the State

E. M. REILLY JR
Senior Curator of Zoology
New York State Museum

SOMETIMES THE PAST history of the world is dim and obscure; more often the facts are so few and far between that only intelligent guesses about the past may be made. Once in a great while the facts tell such clear and vivid stories that startlingly clear and truthful paintings may be made of the great wealth of animal life which preceded us on this planet. Such a picture has been painted by William C. Dilger, of Cornell University, of a scene from the late-Pleistocene epoch (about 30,000 years ago) in our own New York State.

The picture, here reproduced, is worth much more than a thousand words. Scientists in various fields have carried on long years of research to find the facts needed to portray this scene from the past. The picture coordinates the results of research by geologists, paleontologists, zoologists and botanists. The lake in the background actually existed; it is known to the geologists as Lake Ithaca since it resulted from the damming of Cayuga basin drainage by the ice mass so that the site of the present city of Ithaca was covered by many feet of water. The promontories were faithfully reproduced in the painting from a vantage point south of Ithaca, and the water level was raised to conform with delta deposits still discernible about the present lake known as Lake Cayuga. The original painting, in color, now hangs in McGraw Hall, the geology building of Cornell University. It is possible in the original to determine various species of plants still indigenous to upland bogs in New York.

The mastodons, the central theme of the picture, are members of the great elephant family of which more than 350 species are known, from fossil evidence, throughout the world. There are only two species living — both tropical — one found in southeast Asia and the other in Africa. Thus it may surprise some New Yorkers that our State evidently was inhabited by many thousands of these related creatures a mere 10 to 15 thousand years ago. As indicated by the tongue of ice extending into the lake and by the great ice cap still visible as a white horizon line in the background, the mastodons were not tropical animals but preferred a cool temperate climate. The ice cap may have been up to 10,000 feet thick in some places in New York State.

Paleontologists have recovered the remains of these mammals from ancient bogs throughout the State with, in some cases, the plant remains of the pachyderms' last meal still intact and identifiable as plants found in New York today or *in still more northerly climates.* There is an exhibit of such plant remains — in this case, larch twigs — at the New York State Museum. The artist, therefore, was accurate in placing these animals against a glacial background and on the edge of an upland bog. Though perhaps the mammoth is the better known fossil elephant of the two species found in New

From a painting by William C. Dilger made for the Gurley Foundation for Paleontology, Cornell University, Ithaca

Mastodons on the Shore of Lake Ithaca (Glacial Lake Cayuga), Willow Ptarmigan in Foreground; Musk Oxen in Right Center

Mastodons on the Shore of Lake Ithaca (Glacial Lake Cayuga), Willow Ptarmigan in Foreground; Musk Oxen in Right Center

for Paleontology, Cornell University, Ithaca

York, many more mastodon skeletons than mammoth remains have been uncovered in the area. Besides identifying the stomach contents of the mastodons, the botanists have analyzed the pollen found in the same bogs with the fossil bones; in this way the artist can get a clear picture of the plant cover of that bygone day when elephants roamed this region.

In the picture a group of musk oxen is seen approaching from the right background. Today these animals are found only in the tundra regions of the far north. Since they could not exist on the top of the great ice sheet it is reasonable to assume that its advance forced them south before it. Their presence in New York during the Ice Age, long suspected, was confirmed only recently by the discovery of fossil musk oxen remains near Vestal in Broome county. The fossils were located in deposits similar to those in which mastodon bones have been found.

Zoologists have reconstructed an entire mastodon by modeling the artificial flesh, skin and hair. Actual samples of the hair have been found associated with the bones; the color — brown — is conjectural but accepted as most likely according to present knowledge. A life-size restoration — the only one of its kind in the world — on display at the State Museum shows this coloration.

The birds in the foreground are willow ptarmigan, small grouse-like birds which today are found in the Arctic tundra of Canada and whose presence in the scene is based on probability, our knowledge of their habits and our reconstruction of the climatic conditions of that long-gone day. One of these birds is perched on a glacial "erratic," a rock carried from its natural location, scoured and grooved during its transportation, and dropped in the place shown by the retreating glacier.

This detail in the picture adds many words to our story for it tells us that the ice sheet in the background had previously extended farther south. Since the boulder has weathered somewhat from the original state in which the glacial erosion left it, one might even surmise that many centuries had passed since the glacier dropped it. The size of the trees and the extent of the forest in general are also an indication of the time elapsed since the ice scoured their sites clear of all life.

These are but a few of the conclusions which can be drawn by examining the picture in detail. The painting tells much more: the time of day, the season, where the animals probably spent the night and details about the climate. It is definitely not a picture which says simply "This is a mastodon," as on children's blocks, but it tells a complete story and is a lesson in Ice Age natural history. Undoubtedly the reader will be able to glean from the picture other facts which this writer missed or has not mentioned.

There are no longer any mastodons or musk oxen to be found in New York, for without the agency of man the mastodons have disappeared from the face of the earth and the musk oxen from this region. But the artist through the medium of his brush has brought back, accurately and clearly, a scene during one brief moment when these animals were common in New York State.

"Operation Moon-Watch"

A New Way To Study Bird Migrations

STEPHEN C. FORDHAM JR
Supervisor, Delmar Game Farm
New York State Conservation Department

THERE ARE MANY species of the animal kingdom which take advantage of the moon; among them, of course, is man himself. From the dawn of time, no doubt, there have been couples who have professed a liking for watching the moon pass through the heavens. It is more likely, though, that there was not any serious intent to study but rather to seek the contentment that came while falling under the spell of its radiance.

The first real attempt to study the moon with the use of a telescope by Galileo Galilei, probably in the year 1610, gave to us the ideas of mountains and craters in the moon's structure. Today we know of the 100-inch reflecting telescope of the Mount Wilson Observatory at Pasadena, Calif., and its big brother, the 200-inch mirror of Palomar mountain. Many fine pictures taken with these telescopes have appeared in current publications.

But for you and me, and others scattered over Canada, United States and Central America, a new and very interesting phase of bird study has developed. The catch words, "Operation Moon-Watch," could be described easily as a study of bird migration at night by means of the moon and a telescope. How this all developed is an interesting story.

In 1946, George H. Lowery jr, curator of the Museum of Zoology, Louisiana State University, was looking for the answers to some puzzling problems of bird migration. These were, namely, the magnitude of the coastal flight of birds around the "Gulf" and the magnitude of those flights directly over the Gulf of Mexico from Yucatan to Texas and Louisiana. He read of the work done during the early 1900s concerning bird counts with a telescope and the moon, but these works had certain fallacies. With the aid of Professor W. A. Rense, also of Louisiana State University, a formula was devised for correcting recorded bird observations to a number of birds per mile of an intercepted flight path. This formula was a necessity for correcting low angle observations as compared to those taken as the moon approached its zenith.

In 1948 the lunar bird studies made considerable progress with some 200 cooperators in Canada, United States and Central America. In the fall of 1952 the number of cooperators was enlarged once more and the compilation of data collected through January 1953 is now in progress. As one can see, with the addition of all these willing hands much additional information could be gathered to support or disprove present theories concerning bird migration and the concept of flyways.

One of the features of daylight observations, which often proved misleading, was the inability to distinguish actual migrants from resident birds. Lunar bird watching eliminates most of this problem, for only a few species are night-flying feeders and hence most of the birds seen

with a telescope could be assumed to be in flight for but one purpose — migration.

At present we know very little of what makes a flyway or why birds seek the paths they do over our continent. Very little is known of the effects, if any, of large bodies of water on migrating land birds or the effects of mountains, peninsulas and coastal islands on the passage of both waterfowl and land birds. Lunar bird watching should aid us in determining more adequately the usage of these well-defined water and land masses. Specifically, they could be judged more accurately as a barrier or a contributor to what is termed a funneling action in the formation of a flyway.

It is a skip and several jumps from Galileo's piece of organ pipe and two watch lenses to our modern 20-power telescope, but do not let that discourage you. With six and eight-power binoculars the passage of birds across the face of the moon, particularly during the fall migration, can be seen. You will not be able to identify species except in very rare cases of members of the heron or owl families. With a clear, quiet night, you can add to your pleasure by listening for the calls of birds passing in flight. With practice several species can be added to your lists in this manner.

For the serious bird-watcher who would like to join the ranks of those already engaged in lunar bird study, it is best to have available a 20-power telescope. Perhaps your school science class, local bird club, Boy Scout troop or friends can help you in this respect. The mounting of your telescope is important only to the point that it should be sturdy to eliminate vibration. Camera tripods are

Photograph by Stephen C. Fordham jr

Lunar Bird Watching

very adaptable and the same holds for the more expensive surveyor's tripods. For a chair, the most practical is the adjustable, canvas-backed with enough length to support shoulders and head. During an evening the moon will pass from a low near the horizon through its zenith, nearly overhead, so the adjustable features for chair and tripod are desirable.

If possible a group of several interested people should work together during an evening of moon watching. One individual can operate the telescope while another acts as a recorder. By taking turns at the telescope and with the help of alternates a very enjoyable evening can be spent by the group. Of course in the late fall it would be fine to elect a committee of one for the hot drink and sandwiches. The brisk air of the November full moon periods is very invigorating.

The writer is not versed in spherical trigonometry nor the formulas involved in correcting observations. To give you, however, an idea of the observations for two stations on the night of September 3d, 1952, the following condensed table is made:

	Numbers of Observations	
Eastern Standard Time September 3–4, 1952	*Delmar Game Farm Delmar, N. Y.*	*Collins Park Scotia, N. Y.*
6.30– 7.00 p. m.	3	..
7.01– 8.00	60	169
8.01– 9.00	143	94
9.01–10.00	100	41
10.01–11.00	69	42
11.01–12.00	43	25
12.01–01.00 a. m.	35	9
01.01–02.00	20	13
02.01–03.00	17	13
03.01–04.00	13	*
04.01–05.00	10	*

* Station closed at 3 a. m.

All data collected for an evening are forwarded on forms supplied by Louisiana State University. Included is a form for describing your station location and the weather for the evening. Corrected observations will be returned for any personal use the individual desires.

The writer, in cooperation with members of the Schenectady Bird Club, was interested in learning the effects of the juncture of two such large rivers as the Hudson and the Mohawk. The Hudson is already a noted north-south flyway, particularly for waterfowl. The Mohawk, flowing eastward to the Hudson, is also believed to have a marked effect on the flight path of migrant birds. The Adirondack, Berkshire and Catskill mountains, all neighbors of ours, exert their influences as well, but the how and the why leaves much for us to discover in the future.

We hope with the aid of others on Long Island, upstate New York and those people westward along Lake Ontario and Lake Erie, to add much to the bird migration picture. From the alerting call "bird," from the individual at the telescope, to the group discussions later as to the effects of the weather, rivers, lakes and mountains, you will enjoy this new phase of bird study. Perhaps your hobby has been astronomy or bird watching. During the spring and particularly in the fall, turn your telescope to the moon for some interesting bird counts and observations.

NOTE. The Delmar Game Farm is located ten miles southwest of Albany and four and one-half miles from the Hudson river. The Collins Park station was located across the Mohawk river from Schenectady, N. Y.

Jamaica Bay Sanctuary

An Educational Natural History Project for a Great City

CLARENCE COTTAM
Assistant Director, United States Fish and Wildlife Service

PEOPLE, CITIES AND NATIONS NEED safety valves quite as much as do steam boilers or fire engines. The larger the city and the more congested the area, the greater the need for relieving the strain and soothing the frayed nerves of the masses cramped within the brick, stone and steel of civilization. City parks, botanical and zoological gardens, museums, art galleries, music halls, wildlife sanctuaries and other educational recreation centers are developed and maintained to supply a need that seems inherent in Man. Such diversion centers appear almost as necessary as schools, churches or libraries. Normally, the larger the city, the more important it is to provide parks and open areas for public use.

In many respects New York City is unique, not the least being its unsurpassed opportunity for developing a superbly attractive wildlife sanctuary and natural recreational area within its boundary. Jamaica bay is this area — a shallow-water and salt-marsh tract of more than 12,000 acres within the boroughs of Brooklyn and Queens. It is almost unbelievable that such a large sample of natural wildness and isolation could exist within the heart of so large a city. With moderate expenditure, I am confident this bay can become a highly attractive sanctuary for many species of birds, other forms of wildlife and native plants that will give joy and recreation to thousands of New York's citizenry. Furthermore, the bay can serve as a much needed chain in the route where migratory birds may find necessary food and sanctuary. A significant nesting population can also be built up and many thousands of wintering waterfowl will find favored habitat and protection here during half of each year.

The bay is a natural salt-water haven that from time immemorial has been attractive to many species of ducks, shore birds, rails, gulls, terns and herons. Encroaching civilization, lack of protection and management, destruction of the marshes, drainage, fills, serious and unrestrained pollution, uncontrolled hunting, an alarming infestation of rats on the higher "fill" islands where in the past city trash and garbage dumps have been located — these have progressively discouraged use or occupancy of the area by birds, muskrats, fish and shellfish. The problem, therefore, consists of restoration, development and biological management.

Cross Bay Boulevard "fill" divides the bay roughly into two equal parts. More than a score of low island mud flats become exposed at low tide while "fill" islands stand well above the highest tide. On the south, the bay is connected through Rockaway inlet with the Atlantic ocean and is subject to daily tidal fluctuation of about five feet. Salinity varies somewhat but is said to average about 65 per cent of normal sea water.

Nature abhors a vacuum in biology as much as it does in the realm of physics. Consequently any area with the requisite environment has its plants adapted by

Nature to fit that distinctive habitat. In Jamaica bay the marsh plants are influenced largely by water relations but to a lesser extent also by soil type, salinity and other factors. The plant communities on the bay are largely the same as those occurring under similar environmental conditions along most of our Atlantic coast.

In the zone covered daily with water, the tall salt-marsh cord-grass (*Spartina alterniflora*) occurs in solid stands. It is the dominant and most conspicuous plant in the bay. The narrow landbelt inundated shallowly only at the high monthly or storm tides consists largely of salt-grass (*Distichlis spicata*). At a still higher elevation, covered only at equinoctial tides and during severe storms, is found the salt-meadow cord-grass (*Spartina patens*) or marsh hay. This zone is inundated but a few times a year. These tidal zone associations somewhat overlap but their limits are determined largely by their relationships to water levels and periods of inundation.

At elevations above the cord-grass belt, a great array of terrestrial plant species may be found surrounding Jamaica bay. In fill areas at a relatively wide range of elevation and salinity content, the nearly worthless reed cane (*Phragmites communis*) occurs in almost solid stands. Throughout the country it is almost always associated with fill areas where the water supply is adequate.

In much of the constantly inundated areas, eelgrass (*Zostera marina*) formerly occurred in profusion. For reasons not fully known, this valuable submerged aquatic has not made a recovery in this

Photograph by H. L. Dozier
Courtesy of U. S. Fish and Wildlife Service

Big Cord-Grass, with Salt-Meadow Cord-Grass in Foreground

area since its almost complete destruction in 1931 by a mycetozoan disease.

Those plants that are permanently, daily or periodically covered by the tides and, to a lesser extent, most of the others which occur at higher elevations, furnish some food and cover for waterfowl and other birds frequenting the area. Furthermore, these various species help to form a distinctive ecological zone which in turn supports a complex population of invertebrate animal life, upon which many species of shore birds, terns, herons and waterfowl depend to a considerable extent for their food.

Jamaica bay supports — or can be so developed and managed that it will support — a heavy animal population of birdlife, fish and shellfish and other invertebrates. The innumerable periwinkles, blue or mud mussels, amphipods and isopods and a host of other less common or less conspicuous invertebrates in the shallow water and mudflats, form an important or primary source of food for many species of waterfowl, shore birds and gulls.

The presence of hard and soft shell clams, oysters, blue crabs and a number of choice species of sporting and commercial fish is sufficient reason to attempt to make them pollution-free and available to the public. Undoubtedly their numbers could be markedly increased with proper development and sound management. But the culturing of oysters and other shellfish should not be considered until the pollution menace is eliminated. Reports indicate that such choice species of fish as flounders, striped bass, bluefish, mullet and croaker are already fairly common during appropriate seasons of the year. It is essential that the bay be made attractive as feeding and spawning grounds to the resident and migrant fish, both sporting and nonedible species.

Birdlife is common in the bay throughout the year, and it can be made more varied and abundant with appropriate development and management. Even now, the black duck nests sparingly near or in the adjacent marshes, as probably also do two or three species of rails, killdeer, common and roseate terns and black skimmers. Among the groups of birds now known to frequent the area at some time of the year are at least 27 species of waterfowl, 17 species of shore birds, five species of gulls, three of terns, three of herons and, in addition, the coot and several kinds of song and insectivorous birds. Some of the latter already nest in the shrubbery and adjacent marsh areas, and others can be attracted by proper modification of the environment.

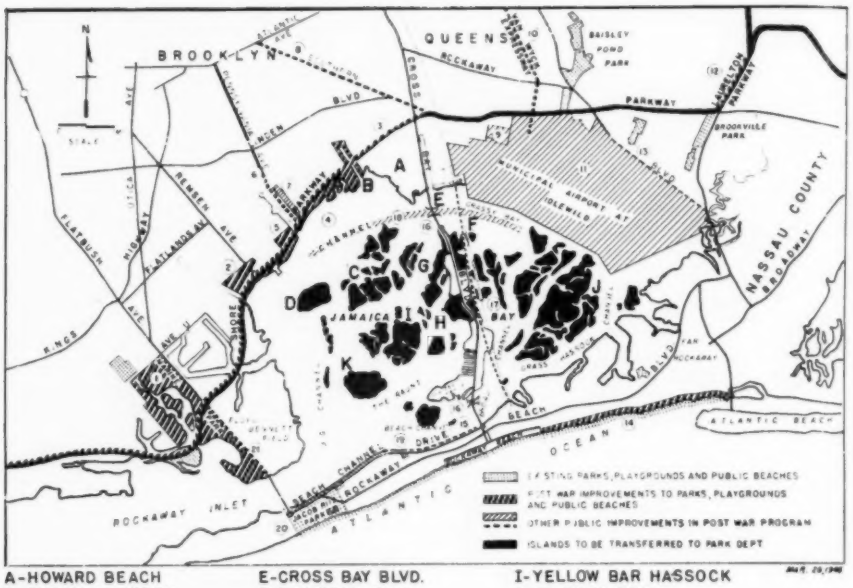
Any proposed restoration program, if it is to be successful, must carefully consider the total environmental factors and especially the extremes of variation and change among them. From a very brief inspection, I believe the following includes some of the major requirements for making this area an attractive and successful wildlife sanctuary:

1 Promptly appoint a qualified superintendent to protect the area and to supervise development. Prohibit all shooting of migratory wild fowl.

2 Clean up pollution. Obviously this great area has suffered from bad planning and supervision in the past. It has been used as a dumping ground, a garbage disposal center and an open sewer. Both organic and industrial wastes have been dumped promiscuously into the bay. Great progress has been made recently in cleaning this up and the rehabilitation program should be completed.

3 Leave as natural marshland as much of the periphery as recreation and other essential uses will permit. Howard Beach (A)* particularly around Old Mill creek

* See map for this and other locations referred to by letters.



A-HOWARD BEACH
B-OLD MILL CREEK
C-DUCK POINT MARSHES
D-CANARSIE POL
E-CROSS BAY BLVD.
F-RAILROAD FILL
G-BLACK BANK MARSH
H-RULERS BAR HASSOCK
I-YELLOW BAR HASSOCK
J-JO CO MARSH
K-RUFFLE BAR

Courtesy of Department of Parks, New York City

Map of Jamaica Bay, Long Island (1945), Showing Location of the Proposed Sanctuary Site and Surrounding Developments

(B) and other marshes, with a little adjoining upland, should be included in the plan in order to develop habitats attractive to a number of species of birds and plants that are dependent upon such an environment. In attracting, developing and maintaining a complex fauna, each element of which requires specific environmental conditions, it is necessary to provide a wide array of habitats.

4 Dike and block off with pumped fill, clamshell dredge or other means, areas where controlled water levels can be maintained and where salinities of the water can be reduced. A joint engineering and biological study should be made to define specific areas and prepare detailed plans. Ponds from six inches to four or five feet deep and from an eighth or quarter-acre to several hundred acres in extent would be most attractive to ducks and geese and undoubtedly would produce much more waterfowl food. If ponds can be developed and the daily tide excluded, the water will become less saline, which would be desirable. Conditions are believed to be favorable and economically possible for drilling and obtaining an artesian supply of reasonably fresh water to help freshen one or more artificial pools. If and when a fresher supply of controlled water can be developed, a number of plantings could well be made.

From the cursory inspection, the following possibilities for controlled impoundments in developing water and marsh areas should be looked into (See accompanying map):

a Duck Point marshes (C). From both field inspection and study of the map,

it would appear that a large part of these marshes could be encircled by a 12-foot dike with a 10 to 1 slope connecting on high land to Canarsie Pol (D). If the dike were built with a clamshell dredge, with the borrow pit on the inside, it should afford excellent fishing opportunities. These potentialities should justify a considerable part of the expense of construction.

b Impoundment between Cross Bay boulevard (E) *and railroad fill* (F). It is my understanding that it is planned to construct a solid earth core as a base for the Long Island Railroad that crosses the bay parallel to Cross Bay boulevard. If this is done, there are distinct possibilities for developing one, or preferably two, splendid pools between these two extensive fills. It would be necessary only to construct a dike connecting Rulers Bar Hassock (H) with the railroad fill.

c Black Bank marsh (G). The development of this marsh, which is adjacent to and connects with Cross Bay boulevard from the west, involves a proposed dike which should inclose as much as is economically possible of the marsh area. It is understood that supplementary fresh artesian water could, if needed, be made available. Plantings of appropriate wildlife food species could be made.

d Yellow Bar Hassock (I) *and Jo Co marsh* (J). It seems probable that diking with a clamshell dredge could be done economically on sizable portions of both these extensive marshes. The borrow pit should be on the inside of the impoundment, as this should greatly improve fishery habitat and also fishing opportunities.

5 In the areas impounded, carry on an appropriate planting program. In addition every effort should be made to reestablish eelgrass in Jamaica bay. Plantings could best be made in those channels between the islands that are not quite exposed at low tide. The establishment of a few trees and fruit-bearing shrubs on Rulers Bar Hassock and around the periphery of the bay would greatly improve the environment for many species of song and insectivorous birds.

6 Attempt some agricultural program, perhaps on Canarsie Pol and Ruffle Bar to grow waterfowl and dove foods such as corn, millet, soybeans and some greens (cereal crop) to attract geese. An agricultural program, even of limited scale, could have tremendous benefit in attracting and protecting birds. It would be certain to increase the goose population, particularly if some "decoys" were placed there to expedite the attraction and building up of a wild population.

7 Inaugurate an effective rat control program on all islands and other land exposed at high tide. A brief inspection of Ruffle Bar (K) disclosed an exceedingly high population of Norway rats which undoubtedly got started when this island fill was used as a city dump and garbage disposal area. No nesting colony of birds can succeed or be attracted so long as these feral rats are so abundant and destructive.

8 Develop a nesting island for aquatic nongame birds. When Ruffle Bar is cleared of rats, I have no doubt that the sandy part not covered with vegetation will be used extensively as a nesting site by terns, skimmers and gulls. As such, it should be kept cleared of most vegetation, and it is still more imperative that it be kept free of rats, mice and feral cats.

Such a program of restoration and manipulation of the natural marshland and tidal flats would be the first step leading to the development of a great outdoor laboratory and center for educational recreation, with unlimited opportunities for experimental study of the natural plant and animal life.

The Black Tupelo Tree

Tolerant as to Habitat, This Tree Is Unique in Its Character and Beauty

WILLIAM M. HARLOW
Professor of Wood Technology
State University of New York
State College of Forestry

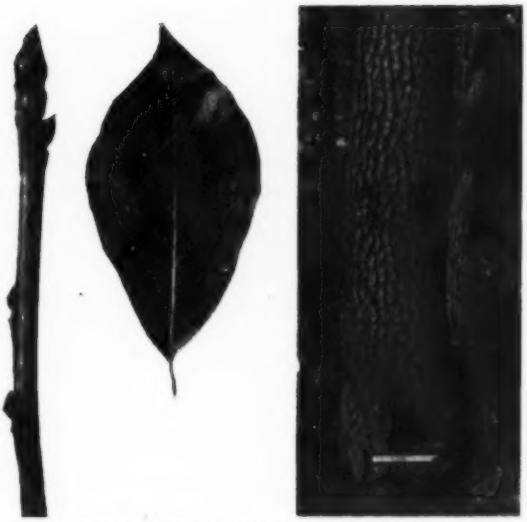
OF THE MANY TREES, BOTH BROADLEAF and coniferous, which cover more than one-third of New York State, none is more unique both in appearance and properties than the black tupelo. This tree is also called sourgum, perhaps because of its bitter or sour fruits; and blackgum, pepperidge, Long Island-holly and wild pear. Its technical name *Nyssa sylvatica* was given to it by the great Swedish botanist Linnaeus. *Nyssa* comes from *nusa*, a water nymph who, according to Greek mythology, was nurse to Bacchus, god of wine; *sylvatica* means "of the woods," and so you might expect to find this woodland tree growing in swamp forests — and so you will! It is not restricted to wet places, however, and throughout its range from southern Maine to Michigan, south to Florida and east Texas, it is found scattered through the broadleaf or "hardwood" forest.

At any age, black tupelo is a distinctive tree. Even when only six feet high, the small side branches depart at right angles from the young trunk; and if you will cut a twig and carefully whittle it lengthwise with a sharp knife until the pith is laid bare, you will discover still another characteristic not found in any other New York State species except the tuliptree. Nearly all trees have a solid uniform pith, but in the black tupelo and the tuliptree, although the pith is solid, you will find tiny crossbars of darker tissue at intervals along the sliced pith. Look at it carefully and notice how it appears like a miniature ladder. The shiny green leaves, elliptical to egg-shaped, have smooth margins and except for their short leaf stems, look similar to those of the pear. When the tree gets older, it bears blue-black, often paired, drupes (stone fruits like cherry) which are highly inedible to humans, although eaten by birds and in this way distributed. Unlike the pits of cherries, those of the black tupelo are prominently ribbed from base to apex, another distinctive feature of this unique tree. The flowers which precede the fruits are small, greenish-white and inconspicuous, but they contain nectar eagerly collected by the honeybee. In the southern states where both the black tupelo and the water tupelo are abundant, beekeepers go into the swamps by boat, carrying their beehives which are set up on raised platforms. The nectar flow comes on with a rush, and for about three weeks the bees literally work themselves to death bringing in tons of honey, (mostly from the water tupelo). Tupelo honey has a pale lemon color and an exquisite mild flavor which makes it top grade among the various honeys produced in the United States.

Old trees of black tupelo are easily recognized because of the heavily furrowed blocky bark which looks something like alligator leather but more deeply fissured. Perhaps no other tree of our

State, unless it is the red maple, stands out so brilliantly in autumn. The bright red leaves provide an unforgetable spectacle.

The wood of black tupelo has an unenviable reputation among those who would use it in the stove or fireplace. Because the wood fibers do not run straight up and down but twist around each other, the grain is said to be "interlocked," and this makes the wood very difficult to split. When cut into veneer, this toughness is an advantage, and berry and fruit boxes, as well as the center layers in plywood, are made from these thin slices of wood.



By permission, from Textbook of Dendrology by Harlow and Harrar, 1950. McGraw-Hill Book Co., Inc.

The Twig, Leaf and Bark Characters of the Black Tupelo or Pepperidge Tree

When the early settlers came to the present site of Syracuse, they found the black tupelo a fairly common tree growing in the swamps which have long since been filled. As the salt industry boomed, pipes were needed to carry the salt brine, and some ingenious worker thought of the idea of boring logs of black tupelo for this purpose. Although this was certainly a laborious task with hand augers, a number of such pipe sections were made and some of them can still be seen at the Salt Museum in Liverpool. The wood was excellent for this purpose because, on account of its toughness, the ends of the pipes could be fitted together without the necessity of using easily rusted iron bands at the ends to keep the wood from splitting.

And so black tupelo is one of our distinctive and, in autumn, magnificent forest trees, known to the pioneer for its quality of toughness and associated with one of the early and important industries of New York State.

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Cover Leaflets Available

Single copies of the colored cover picture of the Bob-White Quail, with descriptive account, are available in leaflet form from the New York State Museum, Albany.

Planting on the Thruway

The Use of Native Plants and Soils in Highway Design

NELSON M. WELLS
Director, Landscape Bureau
New York State Department of Public Works

EACH ENGINEERING PROJECT presents new problems with regard to the conservation of natural resources and the restoration of the natural character of the countryside. Vast scars on the land will result from the construction operations necessary in building the New York State Thruway. The residents of the State may be assured, however, that those who are responsible for the design of this undertaking are giving careful consideration to the preservation and restoration of all natural features along this route and provision of a cover to heal these scars of construction.

When a new highway is built in New York State today, it is customary to strip off the layer of topsoil, save it and replace it on the newly graded surfaces. This is being done so that topsoil will not have to be taken from farmlands for the growth of grass on the highway roadsides.

This policy is of particular significance on the New York State Thruway. Because of the width of this major thoroughfare required to serve a volume of traffic at high speeds, because of its length of 535 miles extending across the entire State and because this highway is being constructed within two or three years, the need of topsoil for seeding over 7000 acres of land within a brief period of time would otherwise be a serious draft on farmlands. The fact that no topsoil is planned to be taken from farms is of great significance to every citizen.

Along highways in general, and perhaps applicable to parts of the Thruway, is the method of growing grasses and legumes where there is no topsoil whatever. Some of these soils come from excavations made 50 feet below the surface in mountainous areas. This revegetation is possible as a result of a careful analysis of the soil, selection of the kinds of grasses known to be tolerant of the growing conditions and feeding of them with chemical fertilizers. It is a new practice which is proving to be economically sound in many situations.

During World War II when many airfields were being built, a great deal of seeding was done on subsoil without the use of topsoil. The successful growth of grasses is evidently more dependent upon the physical quality of the soil — that is, the proportion of fine grain particles in relation to the coarser materials — than to the amount of organic matter present. This is somewhat different from the generally accepted practice of establishing a lawn or growing farm crops where it has been considered necessary to place the seeds in the top layer of a soil which is thoroughly weathered and has a high content of organic matter.

Seeding on subsoil is being done more and more along highways, particularly where the objective is to check erosion and not necessarily to produce lawn qualities. Such seeding is often accompanied by a thin covering of hay or straw which helps to check erosion and also favors the growth of the young seedlings. Some of the plant foods, particularly the

nitrogen, may need to be refurnished for a few years, but in a surprisingly short time the annual sloughing off of the grass roots produces a dark-colored layer of good topsoil in place. Thus new topsoil is being created, instead of drawing on the existing supply of one of our most valuable natural assets.

Plantings being designed for the Thruway will also be of value and interest to the residents of the State as well as to the users of the highway.

The strip of land to be used for this route passes through a considerable range of soils. Most of the soils encountered have resulted from the action of the glaciers which once covered this land. In Westchester, Orange and Ulster counties are many soils which are stony or gravelly and tend to have a fairly high acid quality. Northward toward Albany along the valley of the Hudson river and westward along the Mohawk valley the soils tend to have more clays and silts. Westward toward Buffalo and along the shore of Lake Erie are found a great variety of soils; most of these soils have an alkaline quality. A vast swamp occurs at Montezuma. Other special soil conditions are to be found in limited areas such as a tract of land between Albany and Schenectady where the sand is similar to that found along the seacoast and if not pinned down by vegetation will form into dunes through the action of wind currents.

Between the most northerly and the most southerly sections of the State there is a difference of several weeks in the length of the growing season. Other differences exist in the amount of precipitation and the depth of snow, differences in extremes of winter cold and summer heat and in thawing and freezing cycles.

Throughout this range there is represented a considerable variety of plant life. Plants from the coastal plain of our eastern seaboard exist here. Others which traverse the bridge of the Appalachians from the regions of the north and the regions of the south meet their limits of

Natural Woodland and Seeded Open Spaces Along a Completed Section of the Thruway between Catskill and Saugerties

tolerance in this area. Each type of soil, each variation of temperature and each variation of exposure harbors a different group or association of plant life.

The study of the soils and the study of the local plants is the basis for plans for planting along the Thruway. In general the oaks, tuliptrees, flowering dogwoods, mountain laurel and azaleas are found in the regions of acid soil. Other conditions favor the growth of hickory, ash, maple or hemlock. The kinds of plants used will vary according to the soil conditions and the growth native in each locality. Native plants and trees are to be featured and perpetuated even though the original forest cover may long since have been cleared away for farms or settlements. The use of truly indigenous species should insure their best success and longevity.

By and large, the amount of planting on the Thruway will not be as extensive as has been common along parkways. Most parkways have a fairly continuous belt of plantings along each side so that the views of the traveler are confined to the limits of the public holdings. Parkways are actually elongated parks within man-made scenery and they are built for passenger cars traveling at moderate speeds. The Thruway, on the other hand, involves rather different conditions. It is geared for great volumes of mixed traffic of trucks, buses and pleasure cars. Travel will be at rapid speeds. Most of the route lies in valley lands with views to distant hills, woods and lakes. It does not follow the location of older highways, so a minimum of hamlets and farmsteads lie immediately adjacent; consequently there is no general need for screening and the countryside itself will become the roadsides for the users of the Thruway.

One basic feature of the Thruway is that cars can not enter and leave it at farmhouses or crossroads except at controlled points known as traffic interchanges. This obviates the need for traffic lights while facilitating the free flow of traffic. These interchanges, however, involve grading and construction over a considerable area of land. Some 90 interchanges are planned to be built and a single interchange may cover as much as 60 acres of land or the area of many New York State farms. It is in connection with these interchanges that the greatest amount of new planting will be required.

The interchange areas on most parkways are kept mowed. On the Thruway the interchanges involve areas several acres in extent within the loops of the roads which are the result of the large radius curves involved. It would be costly to mow these areas; they serve no purpose in themselves and groves of trees are considered to be the most nearly self-maintaining cover for the land. At the same time these groves will conserve moisture, provide food and cover for wildlife and add materially to the scenic interest for the traveler.

New plantings can be established in any one of several ways. The ground can be left unmowed and natural seedings will come in. Seeds can be planted or seedling plants can be set out, as in reforesting work. Each of these methods postpones the effectiveness of the results for a number of years. Going to the other extreme would be the method of setting out trees which are several years old, to get a fairly mature effect immediately. Trees 12 to 30 feet high, however, are not only costly to buy but require special soil preparation and intensive maintenance, and the chances of their survival is reduced in proportion to each degree of their size.

An intermediate size of plants has therefore been adopted. Shrubs will ordinarily be two to four feet high and large growing trees will be only six to eight feet in height. These sizes are con-

sidered large enough so they will not be susceptible to the greatest injury from rodents or to smothering by weed growth, and they can be set out in the existing soil by scalping back the turf but without preparing actual tree pits or shrub beds.

The planting scheme at these interchanges includes a moderate amount of planting near the bridge structures to soften and subordinate their artificiality in the scenery, a certain amount of screen planting where required, perhaps some planting in the medial zone between the opposing lanes of traffic to reduce headlight glare, plantings to aid the motorist in quickly determining his route of travel, and the groves of native trees within the interchange loops. Some of these latter trees will be fast-growing, short-lived kinds to act as windbreaks and nurse trees, but basically the long-lived forest tree species such as oak, hemlock, beech, walnut and sugar maple with their understory forest associates will be planted according to the local soils and the local climatic conditions.

These principles of saving and using the existing topsoil and avoiding the use of topsoil, where possible, are conservation measures of considerable magnitude. The restoration and featuring of native growth is also promising from the long-range point of view. No part of such work will be conspicuous to the casual observer but if the new plantings blend unobtrusively with their surroundings it will mean that the work of planning has been successful.

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Weeds --- As Botanists See Them

A Scientific Way of Looking at a Common and Troublesome Problem

EUGENE C. OGDEN
State Botanist
New York State Museum

THE TERM "WEEDS" to most persons brings to mind the plants that spring up in our fields and gardens and require removal in order that the crops planted there may reach maturity and maximum yield. From an economic standpoint they are where they do not belong. A definition that is commonly heard is that they are plants "out-of-place." From another point of view they are not at all out of place. The conditions where they are found are likely quite suitable for them. Plant ecologists, who see the plants in relation to their environment, would find that they are in their proper places in regard to the various factors that determine where plants can or can not grow. But to the gardener who does not want them they are out of place and therefore weeds. Some would merely define them as unwanted plants, yet almost any kind of plant might find itself at some time where somebody does not want it. Unless it usually becomes a nuisance, however, it is not generally thought of as a weed. A potato plant in the cornfield would be a

weed to the farmer, as would a corn plant in the potato field. Yet one would not expect to find either to be classified among the weeds of New York State. The lamb's-quarters pigweed (*Chenopodium album*) is one of our commonest garden weeds, crowding out the vegetables and thought by most gardeners to be " no good for man or beast." Its abundant fruits, however, furnish a nutritious food for many small birds, its leaves make a delicious pot-herb and it has been grown by farmers because of its value as a green manure. Still, where we plant radishes it is a weed. Wants and unwants vary enormously with different people. Our common white daisy (*Chrysanthemum leucanthemum*) is enjoyed in varying degrees depending on whether one owns a hayfield that it is invading.

The plant scientist who needs to determine why a plant is a weed must consider the problems from another viewpoint. To him, a weed is any aggressive plant. That is, it is a plant with characteristics that enable it to compete successfully with most other plants, allowing it to crowd out its neighbors and, unless checked, take over the area. This viewpoint considers the characteristics of the plants rather than the preferences of man. The factors involved, causing some plants to be much more aggressive than most others, include: a large number of seeds; seeds with adaptations for rapid and distant dispersal, such as winglike structures and therefore air-borne or with edible parts that are appealing to birds; seeds that can remain alive for years under conditions unsuitable for germination; seedlings that will persist through changeable weather conditions, especially extremes in temperature; plants that are so constructed that they can absorb a large proportion of the available water and retain it during dry periods; plants that

From a kodachrome by Stanley Oliver Grierson

These Clumps of Purple Loosestrife (Lythrum salicaria) Bordering a Putnam County Beaver Pond Are Beginning an Invasion That Will Crowd Out the Burreeds and Other Aquatic Vegetation

are tolerant of shade and by rapid growth soon shade out those plants that require more light; plants that are unpalatable to grazing animals; plants with ability to develop on soils low in available food materials; plants with inherent freedom from serious fungus and insect pests; and a host of others.

Weeds are found throughout the plant kingdom among the algae, fungi, mosses, ferns and seed plants. In the flowering plants more weeds are found in the composite family (*Compositae*) than in any other; but we would expect that, for it is our largest family in number of species. Over 50 other families have weedy members. One scarcely expects to find orchids classed as weeds, but one (*Epipactis helleborine*) is now showing such tendencies.

If one were examining a list of the 100 worst weeds in this State he would be struck by the fact that only a few of them were here when the first white men arrived. Three-fourths of them were not anywhere in America. Most of them came from central Europe where, interestingly enough, they are usually not as troublesome as with us. A reasonable explanation for this is that these plants have, temporarily at least, left behind them many of their natural enemies. Finding a suitable soil and climate they have advantages over our native species whose fungus and insect enemies hold them in check. This theory would have more strength if American plants which reach Europe became serious weeds. But, with a few exceptions, they do not. A waterweed (*Elodea canadensis*) is indigenous here and semiweedy. It is one of our best aquarium plants and upon being introduced into Europe accidentally got into the Thames river at London, where it increased rapidly and became an expensive pest.

In New York State, at the present time, we have about 14 species of hawkweeds (*Hieracium*). Five of these are native and are not aggressive. They are found at the edges of woods and along watercourses; one has to hunt to find them. The other nine are European migrants. All are weedy, with six or seven of them being among our worst invaders of hayfields. There are about nine species of dandelion (*Taraxacum*) that are native in northeastern North America. We have not yet found any of them in our State. The common dandelion that invades our lawns (*T. officinale*) is a European traveler. Another European adventive competes with the dandelion. It is the common plantain (*Plantago major*). Three other European plantains and one from our prairies are field weeds. The five native species cause us no trouble at all.

Numerous other similar examples can be given. We might even broaden the term "weeds" to include some members of the animal kingdom, as the English sparrow and European starling. We have native rats which do not trouble us like the brown rat from Europe that swarmed to our shores. We have native mice but the house mouse, also from Europe, is the primary one that invades our pantries.

As our plants and animals have generally not acted the same way in Europe, we shall have to look for some explanation additional to their leaving behind them some of their parasites which keep them in biological balance. A number of theories have been advanced. A reasonable answer lies in the different geological histories of the two continents during the last great ice age (Pleistocene). During this period in Europe the glacial ice came from the Arctic, the Alps, the Urals and the Pyrenees and met, denuding the area of all forms of life. After the retreat of the ice, the plants which repopulated this area came from some distance, mostly from the Mediterranean region. The most successful ones were those that got there first, whose seeds

could remain viable under hazardous conditions, whose seedlings would develop rapidly by utilizing available moisture and retaining it during dry spells, those that could survive on relatively sterile soil, crowding out, starving out, shading out their neighbors — in other words, the aggressors, the weeds. Evolution moves fast under competitive conditions where chances for survival hang by slender threads. Eventually a biological balance was reached, but many of the plants retained their inherent aggressiveness. In new situations, relieved of some of their parasites and among less competitive species, this natural aggressiveness becomes evident.

In eastern North America the glacial history is somewhat different. The advances of the ice were from the North or nearly so. New York State was covered and denuded except for the Allegany Plateau region. Even while ice blanketed most of the State, many plants flourished on this plateau and elsewhere not far south of our border. There is some evidence, in fact, that there may have been islands of land in this sea of ice covering northeastern North America, not in New York State perhaps, but not far away. At any rate with the retreat of this ice the plants that repopulated our areas did not have far to come. Thus the less aggressive species were able to become established and form close associations before the distant travelers arrived. So this may be why so many (more than 1000) of the European plants have been able to become established in North America and hundreds of them have run riot. They are thoroughly successful wild plants and their success may be compared with that of the European rat, European mouse, European sparrow, European gypsy moth, European corn borer and European man which are rapidly replacing our indigenous rodents, birds, insects and American Indians.

If this be true, can we make use of such knowledge to aid us in the control of such plants or perhaps to put them to good use? As to the latter possibility, a number of aggressive species are very useful. It takes plants with weedy potentialities to be effective in erosion control, to produce on wasteland food and cover for wildlife, to enrich a sterile soil so that it may become suitable for our more tractable species. Weeds of the cultivated fields may be extremely beneficial plants elsewhere. Some of our vetches (*Vicia*), clovers (*Trifolium*) and bush clovers (*Lespedeza*) are aggressive and effective in soil improvement. The common bracken (*Pteridium aquilinum*) may ruin pastures but is one of the best cover plants for small animals. Our weediest milkweed (*Asclepias syriaca*) is one of our choice honey plants.

In many situations removal of unwanted migrants is a costly procedure. They seldom are able to take over an area where the biological balance is stable and the association is more or less closed. When such an area is disturbed the aggressors swarm in and form a new association before the original components of the flora can re-establish themselves. We should carefully avoid upsetting a biotic situation if we are not prepared to protect it from the inroads of undesirable species.

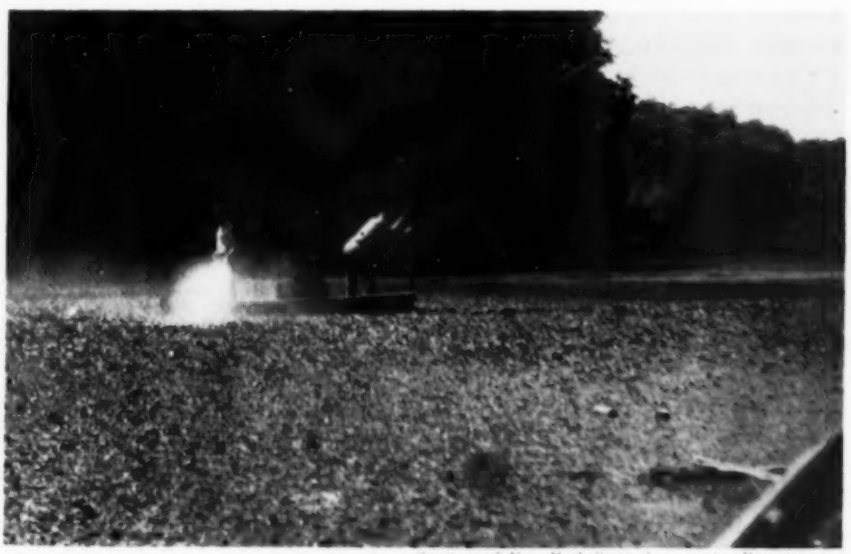
The introduction of natural enemies for the control of unwanted species has been used with success in a few instances. One of the most striking examples was the control of prickly pear cacti (*Opuntia*) that had been introduced into Australia as ornamental plants. In 30 years they were out of control and had soon rendered 60 million acres unfit for agricultural uses. Insect enemies were introduced from Texas and Argentina which, together with their associated microorganisms, checked further spread of the cacti and allowed about 25 million acres to be reclaimed. The hazards of such

methods are great in that the introduced parasites may attack valuable species.

In most situations it is still necessary to remove the weeds by hand or machine. Sometimes, however, chemicals can be used to obtain the required results more economically. Such chemicals are of various types and the principles which govern their effect on plants may be quite different. Common salt in quantity in the soil can cause such water loss that the plants will wilt and fail to revive; too much fertilizer close to the roots has the same effect. Some species are more salt tolerant than others, but in general this type of chemical kills all the plants and renders the soil unfit for use for some time.

During the past few years research on chemical control of weeds has given us materials that are effective without sterilizing the soil. Many of them act selectively, removing the unwanted species without serious harm to the others. Such selectivity may be due to the variations in resistance by different kinds of plants to the substance used, but more often it is due to retention by the various species of different quantities of the poison. By virtue of this latter principle, we can eliminate the broad flat-leaved weeds in the lawn because the liquid rolls off the upright slender slippery grass leaves. Some such herbicides are contact poisons, others are translocated to parts of the plant where they cause fatal abnormalities, especially those of the hormone or growth-regulator types.

Regardless of the method of eradication or control, it is sure to be costly. Recent estimates indicate that farm losses due to weeds in the United States are approximately five billion dollars each year, which is more than the loss from insects and plant diseases. These figures do not include the effect of weeds on our lakes, streams, marshes and upland wild areas, where a cure is difficult but prevention may be possible.



Courtesy of New York State Conservation Department

Experimenting on the Control of the Aggressive Water Chestnut (Trapa natans) in the Mohawk River

Courtesy of Pennsylvania Game Commission

A Wild Hen Turkey on Her Nest and Brooding Newly Hatched "Poults"

habitat. The result of these combined operations has been the reappearance of wild turkeys within our own boundaries, as previously mentioned.

Since we are removed only about 250 years from the time of the primeval forest, it is possible to reconstruct with fair accuracy the nature of the turkey range. We know that the forest, while it covered nearly all the land area of the State, was not static but was subject to changes — some sudden, some long drawn out. It was not a solid stand of massive, centuries-old trees though there were large areas of these, but contained trees in all stages of growth. There were sudden, catastrophic changes like windfalls created by tornadoes or hurricanes like that of 1950, which overnight could alter the forest cover on thousands of acres. Fire, caused by lightning or deliberately set by the Indians to drive game to their hunters, to clear land for agriculture, to create dry firewood or to create openings so that grasses, herbs and woody sprouts would attract game, created many changes in the forest. The famous oak openings reported by travelers in central and western New York were created by repeated fires in forests underlaid shallowly by limestone.

A gradual change affecting the composition of the forest that had been taking place during several thousand years was a shift from a warmer, drier climate, favoring oaks, hickories, chestnut and the pines, to a cooler, moister climate, better suited to such species as beech, maple, birch and hemlock over much of the State outside of the higher mountains. As a result the oaks, hickories, chestnut and the pines were more restricted to the warmer, drier soils, either because they were excessively drained or because their occurrence on south slopes meant a greater amount of

heat from the sun during all seasons. White pine seems to have been able to maintain itself in the more recent hardwood forest only because repeated or catastrophic fires reduced the forest floor to a mineral soil and permitted the pines to seed in thickly enough to compete against the hardwoods.

The best clues as to where wild turkeys were found are furnished by their food habits. The principal food items are fruits and seeds: beechnuts, acorns, chestnuts (formerly), cherries, grapes, dogwood seeds, woodbine, Juneberries, blackberries, raspberries, sumacs, poison ivy and many others; also much green foliage — grasses, sedges, ferns, mosses, club mosses and other herbaceous plants; and insects in season. Water requirements are considerable but are generally well met by springs, seepage areas and streams in the forest.

In New York the key to wild turkey distribution seems to have been the occurrence of the oak-chestnut and oak-hickory forest types. The Lake Ontario-Mohawk valley line, with a northward extension in the Hudson valley to Lake George, was approximately the north boundary of these types. Within this area the oak-chestnut forest occurred on favorable sites — well-drained soils, generally on south-facing slopes, where warm, dry conditions were favorable for maintenance and reproduction of the plants making up the type. The largest areas of oak-chesnut occurred in the Hudson valley, throughout the Finger Lakes region, the Genesee valley, the Cattaraugus, Allegany, Chemung, Susquehanna and lower Delaware valleys. Areas described as oak-hickory forest occurred on the thin soils over the limestone rocks from Syracuse west to Buffalo and northward along the Niagara river.

Because of variations in slope and exposure these types were everywhere broken up by, or adjacent to, areas occupied by the northern hardwood forest, of which beech was a principal constituent and black cherry an important associate nearly everywhere, so that in years of poor acorn and chestnut crops there would be a possibility of several other nut or seed crops, and vice versa. Since the more mature trees fruited better than the younger and more crowded ones, the importance of a considerable area of mature timber to turkeys can be understood.

One rather important limitation upon the availability of food to turkeys is the weather. A cold spring with late frosts can mean failure of the trees to set seed. A cold winter with deep snow lasting for several months can lock up the food supply with serious consequences to the turkeys, as it may have done in 1641, and as it has been observed in our century. As recently as the 1951–52 winter, observers in a western state found that four feet of snow were too much for turkeys to penetrate for food. Fortunately such extremes do not occur often.

Probably the greatest hazard to wild turkeys in their attempt to return is man himself. Human nature being what it is, the larger the bird or animal the greater the temptation to violate the rules of conduct. Among wild enemies, the great horned owl, the foxes and dogs are the greatest potential hazards to the adults while raccoons, skunks and crows are known to be nest destroyers.

Whether wild turkeys can return as permanent residents in New York State remains to be seen. Probably the ideal way for us to learn would be to let the turkeys do it their own way, with only protection against poaching. Since man is an impatient creature, however, and seldom satisfied with Nature's rate of change, the turkeys might as well get braced for a shove.

Flowering Dogwood

Bob-White

WERE SOMEONE to hold a bird popularity contest, bob-white would surely be among the winners. Throughout his range from New England to Florida and west to Colorado the bob-white quail is well known and a perennial favorite. The farmer knows him as a destroyer of crop pests, with no bad habits; the hunter sees him as the sportiest of upland game; and the naturalist who prys into his domestic affairs finds only sterling qualities.

The bob-white is not a woodland species but lives best in regions of mixed farming where weedy pastures, grain fields, truck crops and hedgerows provide varied habitat. He is a ground-loving bird, usually seclusive and more often recognized by his sweet whistle, "ah, bob-*white*" or by his explosive flight than by the brown, black and white pattern of his plumage, as portrayed in the lively picture of a male by William C. Dilger. His mate's plumage is similar but subdued in color.

The bob-white's whistle is heard most often in the spring when males are seeking mates. Mated males soon cease whistling, and it is believed that bob-whites heard in summer are males which failed to find mates. In May, both male and female build a shallow nest on the ground under sheltering vegetation. From ten to as many as two dozen white eggs are incubated for about 23 days. A good father, the cock bob-white helps with incubation and rearing of the family. The tiny, fluffy chicks are able to run about soon after hatching but they require a great deal of care to keep them warm and dry. During their first ten days losses from exposure may be high. They grow rapidly and are able to take short flights when only two weeks old.

Bob-whites are home-loving birds, seldom traveling more than a mile from where they were hatched. They eat many insects in the summer and resort to wild fruits, seeds and mast through fall and winter. In the fall more than one family may join to form a covey, roosting together at night in a tight warm circle with tails toward the center. If alarmed, the covey "explodes" in all directions; when danger has passed, the quails give a distinct rally call and reassemble.

Unfortunately the bob-white is scarce at present in most of New York State, being found commonly only on Long Island and in the lower Hudson valley. When white men first came to New York the bob-white probably was very rare if present at all, because most of our State was covered by dense forest. The clearing of land for farming provided quail habitat, and through the years the bob-white spread slowly northward until it reached Lake Ontario. New York winters, with heavy snow and sleet, often make living precarious for the bob-white. Food may be covered by snow for long periods and sometimes entire coveys will perish under crusted snow. Rigorous winters, combined with heavy hunting and reversion of much farmland back to woods has reduced the numbers of bob-white in New York in recent years. It may also be that the introduction by well-meaning sportsmen of smaller, less hardy Mexican bob-whites weakened the northern birds and resulted in decreased populations.

Encouraged by protection and habitat improvement, bob-white is reappearing in some New York localities. We would like to see him back, but even though we do all we can to aid him, his spread northward is bound to be slow.

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